Student Edition

California Education and the Environment Initiative

6

Science Standard 6.6.b.

Energy and Material Resources: Renewable or Not?

California Education and the Environment Initiative
Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:
California Environmental Protection Agency
California Natural Resources Agency
Office of the Secretary of Education
California State Board of Education
California Department of Education
California Integrated Waste Management Board

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Key Partners:
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As Good As Gold

California is rich in natural beauty and natural resources. Our state's natural resources feed us and provide our fuel. They are the focus of our jobs and a basic part of our daily lives, but not just our lives. Our state's resources are in high demand across the nation and around the world.

Our resources are commodities. That means that businesses buy and trade our resources on the world market with other countries, businesses, and people. The money earned helps our state's economy. It may seem strange that our land, trees, and animals have a dollar value, but they do. Some of our state's most valuable natural resources are fish, oil, and the Sun.

Fish

California is famous for its agriculture, but our fishing industry also has a long and important history. The ocean, streams, and rivers have always provided the people of California with fish. As more people settled in our state, they caught more fish. This changed the supply of fish. Sardines—once easy to find in California's ocean waters—almost disappeared by the late 1800s. Instead of sardines, fishing companies began to catch tuna. They caught so many tuna that after the 1950s, the number of tuna began to decline, too. Many fish companies realized their businesses would disappear if the fish disappeared. They had to change what they were doing, or they would have to catch other fish.

One option was aquaculture. Aquaculture is the practice of raising plants, fish, and shellfish in the ocean or in natural or human-made ponds, lakes, and rivers. Aquaculture began in the 1850s with oyster farms. Today,

School of sardines

Tuna in purse seine (net)

California's aquaculture farms raise more kinds of products than any other aquaculture farms in our country. "Fish farms" raise everything from tiny algae to huge white sturgeon. The white sturgeon's eggs are sold as caviar that costs more than $70 per ounce. California sends caviar to fine restaurants from New York City to Tokyo. Other farmed fish include catfish and salmon. Our fish farms also raise fish, such as trout and bass to "stock" lakes in our state. Many of the fish caught by weekend fishermen were hatched on a fish farm.

Farm-raised fish are a valuable commodity. Some are sold as pets. The rest are sold as food. Some, like abalone, are delicacies sold around the world. Resources from our aquaculture farms were worth over $70 million in 2007. As the demand for fish grows, the value of California-farmed fish as a commodity will increase.

Oil (Petroleum)

Decomposed plant and animal matter buried under rock millions of years ago formed California's oil deposits. Large pockets of oil lie under our land and the waters off our coast. Oil companies tap the pockets of oil by drilling wells and pumping out the oil. Refineries turn the oil into gasoline and other petroleum products. These include plastics, vinyl, rubber, foams, and cleansers.

Oil is not easy to get. Oil companies have to drill deep wells, often as deep as 2,500 feet. Some drill up to 7,000 feet deep (more than a mile). Drilling for oil off our coast is even more difficult. Oil companies must first go through the ocean water to reach the rock below.

Our petroleum industry is the fourth largest in the nation. Oil companies drill for oil and natural gas in more than half of California's 58 counties. Most of the state's oil wells are in Kern County in the Central Valley. Drilling also takes place in the ocean along our southern coast. Oil wells pump about a million barrels of oil out of the ground

every day. Most of this oil comes from our wells on the land.

California's supply of oil will someday run out. Because the supply is limited, oil is a valuable commodity. The oil still in the ground in California is worth about 26 billion dollars. As time goes on, and more people drive cars, we will need more oil to make gasoline and other products. Because the oil supply is limited, reusing motor oil and other petroleum-based products is also important. California companies recycle used motor oil, cleaning it up so it works like new. Chemists at these companies have also found ways to make oil-based products out of different materials. One example is synthetic motor oil. One day, we may need less "new" oil from our ocean and land.

Sun

Surfers and beachgoers love California's sunshine, but its value goes far beyond a good day at the beach. California is one of the nation's sunniest states. Our sunshine attracts visitors and helps our farms grow crops all year. It can also provide us with a source of energy.

In the late 1800s, Californians began using the Sun's energy to heat water. By 1897, thousands of people in Pasadena had built some of the first solar water heaters. Flat boxes on their roofs contained rows of small pipes. These pipes were painted black to absorb as much heat as possible from the Sun. Hand pumps moved water up and into the pipes. As heated water was needed, a large pipe brought it back down to a faucet.

After oil was discovered in California in the 1920s, machines that ran on gasoline became popular. Many homes and businesses began burning natural gas or oil to heat water. For about 50 years, oil and natural gas provided almost all heating and transportation in the state. Oil was also used to

Oil derrick

Solar water heater

make most of the electricity we needed. When oil prices began to rise in the 1970s, some people again started using the Sun's energy to heat water and their homes.

Today, we capture the Sun's energy in ways that are similar to those used in the late 1800s. Instead of black pipes, we use materials such as silicon. When sunlight hits the silicon (semiconductor material) in a "photovoltaic" cell (a power cell that can collect light energy) some of the light energy is absorbed. This energy can be captured in a way that allows us to produce electricity. California has several manufacturers of solar panels that are sold throughout the U.S. California companies were the first to use solar power to run their businesses. Now many homes in the state also run on solar power. In addition, more than a million homes produce hot water using the Sun's energy.

As our population grows, our use of natural resources also grows. Over millions of years, California's climate and geology created some of the state's most valuable natural resources. Some of these resources are depleted by how much of them we use. Other resources are not. For example, the Sun is an inexhaustible resource. It will not run out for a very long time. Many kinds of fish can be considered renewable resources, thanks to responsible fish farming. A resource like oil is nonrenewable. Oil cannot be replaced as quickly as we use it. Some day, it will run out.

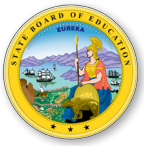
California's industries have changed the way they do things because of changes to our natural resources. Aquaculture farms work to make sure that the products they provide and the ways in which they get resources do not cause problems in the future. Other California industries are finding ways to make resources renewable. Many are finding ways to make our nonrenewable resources last longer. All this creativity is good for the economy, and for the environment.

Solar panels

Fish farm

Aquaculture…

- is the farming or cultivation of freshwater or saltwater organisms.
- produces fish, shellfish, and algae.
- occurs under controlled conditions.
- may use land-based or open-ocean production facilities.
- increases the quantity of fish stocks.
- increases the reliability of fish stocks.
- was worth 70 million dollars in California in 2007.
- provides fish protein for people's diets.
- leads to the build up of waste products from animals, which can cause health problems for the fish or shellfish.
- may involve feeding farmed fish manufactured fish meal, some of which contains high levels of mercury. Mercury can build up in the fish and cause health problems for human consumers.



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